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of

ALFRED O. EISELE

for:

WRITING INSTRUMENT HAVING METAL CASTING AND PROCESS FOR THE MANUFACTURE THEREOF

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BACKGROUND OF THE INVENTION

The invention relates to writing instruments, specifically pens and pencils having unique and distinctive characteristics, features and feel. In particular, the invention provides such writing instruments having very highly detailed, preferably pewter metal castings thereon, and a process for the manufacture of same.

Writing instruments have existed at least from prehistoric times, viz. the crude symbols and pictures found on the walls of ancient caves. Over the years, writing instruments have been perfected and evolved to the present day, wherein pens and pencils are available in a wide variety of shapes and sizes, and range in cost from a few cents to hundreds of dollars. Individualized pens and pencils today are the products of a large and worldwide market. Pens and pencils which are embellished with the owner's initials engraved in gold or silver form prized keepsakes indeed, and become possessions which last a lifetime in some instances.

Ball point pens can be found in both the retractable type, in which the writing tip extends from and retracts into a barrel, for example by pressing on a push button at the distal end of the barrel or by rotating one portion of the barrel relative to another portion. Such pens are also available of the fixed type, some having removable caps, in which the writing tip at the proximal end of the barrel is permanently affixed to the barrel. Generally the retractable types are more costly to manufacture and, as a result, are more expensive than the fixed type. The retractable types are preferred for their ease of transport in a pocket or purse, because the writing tip can be retracted and will thus not mar or stain a shirt pocket or purse or objects therein.

For convenience and clarity of description, the present discussion and specification will focus upon the retractable type of ball point pen. However, the principles described, and the claims appended hereto, are all-encompassing and apply to fixed tip pens, of the ball point and/or the liquid ink variety, as well as to mechanical pencils. A matched set of pen and pencil using the principles of the present invention is particularly contemplated.

Pens which have various forms of ornamentation thereon are known, for example, in U.S. Patent 6,299,373 B1, which discloses a ring assembly for a pen wherein adhesion of a decorative sticker on the barrel of the pen is reinforced. U.S. Patent 1,387,625 discloses interchangeable display exhibits, such as pictures or inscriptions, which are attachable to pencils or pen holders. U.S. 1,262,788 discloses advertising displays on split sleeve-like attachments which slide over the barrel of a pencil or pen. A more recent reference, U.S. 6,332,727 B1, discloses a whimsical ball point pen having ornamentation wherein an ornament body produces diverse shapes. Multiple direction changes cause the ornament to make amusing twisting dances with the rotation of the pen barrel.

Unlike the prior pens and pencils disclosed in these references, the present invention relates to ornamentations on writing instruments, both pens and pencils, which are of intricately designed pewter metal and which are cast thereon by a centrifugal casting technique. Centrifugal, or spin, casting has been employed in the past to make costume jewelry, ornamental items, and metal castings, and wax investment casting patterns for precision engineered products. Such casting methods offer economic advantages in low volume production and employ relatively low cost tooling.

Centrifugal casting generally involves use of a pair of complementary disk-shaped rubber mold halves which are formed with a series of cavities therein. When the complementary rubber mold halves are placed together, a multi-cavity mold is formed. This multi-cavity rubber mold is clamped together by air pressure between rotatable metal plates in a motor driven table. As the mold spins on the table, molten metal is poured into the center sprue of the mold, and the metal is forced outwardly through radial passageways in the mold by the centrifugal forces imposed by the spinning, and fills the mold cavities. Rotation speeds typically can range from 100 to 1000 RPM, depending on the size of the mold and the material being cast. When the mold charge is completed, the rotation may be stopped, the mold cooled and opened, and the cast parts removed.

By this technique, emblems to be cloisonned have been made, as discussed in U.S. Patent 4,597,146, formed of aluminum, zinc, lead, tin or other alloys to produce pewter, electrotype lead, white metal or other alloy having a low melting temperature. U.S. Patent 5,040,590 discloses apparatus said to be useful in cooling the molds employed in centrifugal casting of metals used in the production of costume jewelry.

Nowhere in the known art is a teaching or suggestion of highly detailed, pewter metal ornamentations cast on and affixed to writing instruments by a centrifugal casting technique. The production of such unique writing instruments is an objective of this invention.

SUMMARY OF THE INVENTION

A writing instrument is provided having a tubular barrel housing a writing mechanism and a writing tip, wherein the barrel has a three-dimensional metal casting extending circumferentially therearound. The invention includes pens, pencils, and matched pen and pencil sets. The writing instrument barrel is preferably made of wood or plastic and the metal casting preferably is pewter, but other alloys such as alloys of aluminum, zinc, tin, or combinations thereof, which have a sufficiently low melting temperature to permit centrifugal casting thereof, would be suitable. The metal casting may have a plated coating thereover of a precious metal such as gold or silver. Also provided is a centrifugal casting process for casting pewter or other metal alloy having a sufficiently low melting temperature to permit centrifugal casting thereof onto a workpiece, wherein the workpiece is coated with a heat-resistant coating material prior to casting and wherein the workpiece is preferably a wooden or plastic pen or pencil barrel. The heat-resistant coating is preferably a heat-resistant varnish which makes possible the casting of pewter onto wood and plastic for a short period of time.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is an isometric view of one embodiment of a writing instrument in accord with the present invention in the form of a retractable ball point pen;

Fig. 2 is a front elevation, in perspective and partly broken away, of a pewter metal casting affixed to the barrel of a writing instrument according to the invention;

Fig. 3 depicts a tubular barrel precursor component used in the writing instrument of Fig. 1;

Fig. 4 shows a coating being applied to the precursor barrel of Fig. 3;

Fig. 5 depicts a three-dimensional , pewter metal casting affixed to and extending circumferentially about the tubular barrel of Fig. 4;

Fig. 6 completes the sequence and depicts the completed writing instrument of the invention;

Fig. 7 is an isometric view of the master model of the decorative emblem and instrument shaft to be used to make the master mold used in the process of the invention;

Fig. 8 depicts the making of the rubber molds used to produce the writing instruments of the invention;

Fig. 9 shows the beginning of the casting process, wherein tubular writing instrument barrels are placed into the mold cavities prior to casting;

Fig. 10 shows removal of the instrument barrels after the three-dimensional pewter metal castings have been cast thereon and affixed thereto; and

Fig. 11 depicts the final assembly of a writing instrument of the invention.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS WITH REFERENCE TO THE DRAWINGS

A hand-held writing instrument is provided having a tubular barrel housing a writing mechanism and a writing tip, the barrel having externally affixed thereto, and extending circumferentially therearound, a three-dimensional metal casting. Pens, pencils and matched pen and pencil sets are provided. The writing instrument barrel is preferably made of wood or plastic, and the metal casting is preferably pewter. Also provided is a process for making the writing instruments of the invention.

A detailed description of the invention and preferred embodiments is best provided with reference to the accompanying drawings, wherein Fig. 1 depicts a

complete retractable ball point pen **10** in one representative embodiment of a writing instrument according to the invention. The pen **10** comprises a wooden or plastic barrel **12** housing a standard ink cartridge (not seen, described below), writing tip **16** and threaded tip housing **18**, and having push button **22** and conventional clip **20**. Affixed to the barrel **12** and extending circumferentially therearound is the three-dimensional, metal casting **14**, which is cast in place onto the housing **12** as described in detail below. While this embodiment will be described with reference to a ball point pen, it is clear that the principles of the invention apply to and extend to a variety of writing instruments including ink pens, ball pens and a variety of pencils. Matched pen and pencil sets are also included.

A high degree of detail is made possible in the castings according to the invention. The intricacy and degree of filigree in the castings of this invention essentially can be as detailed as the skill of the artisan who makes the master used to create the casting mold. Such castings, accordingly, can be extremely detailed. An illustration of a casting **14** depicting a unicorn and having associated indicia **15**, all cast upon and affixed to a barrel **12**, is shown in Fig. 2.

The invention is particularly suited to casting of relatively soft alloys such as pewter onto substrates, i.e., writing instrument barrels, such as wood or plastic which have melting/decomposition temperatures below that of the molten metal being cast. Pewter is especially suitable and, generally, alloys of aluminum, zinc, tin or combinations thereof are contemplated, wherein each alloy has a sufficiently low melt temperature to permit centrifugal casting thereof.

To prepare the ornamented writing instruments of the invention, one starts with a wooden or plastic tubular barrel **32**, as shown in Fig. 3. The barrels, or shafts, may be turned on a lathe, both inside and outside, to precision tolerances.

For wooden tubular pen barrels **32**, pre-treatment of the wood is desirable to impart heat resistance and hardening to the wood, to control inherent moisture in the wood, and to prevent shrinkage on casting. This pretreatment is effected by applying a heat resistant varnish or lacquer as a coating to the wooden barrels, and a lacquer supplied by the Heilemann Company, GmbH, Baenglesaelker 21, D-73527, Schwaebisch, Germany, has been found to be especially suited for this application. The preferred lacquer is Heilemann's product designation 660-Q0237-00, which is a composition generally comprising

about 1-2.5% ethylbenzene, 2.5-10% xylol, 50-90% ethylacetate and 2.5-10% 2-methoxy-1-methyl-1-ethyl acetate, wherein percentages are by weight of the total compositions.

A hardening agent is also preferably applied as a precoating to the wooden shafts, and a suitable hardening agent is a varnish designated 610-001170-00, and also supplied by Heilemann.

An especially suitable precoating for wooden writing instrument barrels is a 90%/10% mixture of lacquer and hardening agent, wherein percentages are by weight.

Preferably each wooden shaft is pre-treated twice and allowed to dry for at least two days following this treatment.

For plastic instrument shafts **32**, pretreatment using a heat resistant lacquer is generally sufficient, and the hardening agent is not needed. A suitable lacquer for this treatment is a heat resistant lacquer, a preferred composition of which is the product designated #665-Q0429-01 produced by the Heilemann Company aforesaid. For plastic shafts **32**, only one treatment is usually required, with a drying time of about two hours being adequate. Suitable plastics for use as writing instrument barrels will include polycarbonates, nylon, DELRIN®, ABS, polyethylene and others known to those skilled in this art.

Pretreatment of the shafts/barrels is accomplished by either dipping or brushing and is depicted schematically in Fig. 4. Therein the hollow barrel **32** is depicted as being coated with the pretreatment composition **34** described above, wherein the arrows are intended to schematically represent the application of the lacquer **34** upon the barrel **32**.

Fig. 5 shows the wooden or plastic pen or pencil barrel **12** after extraction from the casting molds, all described in more detail below, and wherein the metal casting **14** is affixed thereto and extends circumferentially around the barrel **12**. The writing instrument assembly is completed as shown in Fig. 6, for example, with the insertion of retractable ball point pen mechanisms into barrel **12**, including cartridge housing **18**, pen clip **20** and push button or plunger **22**.

The process for making the adorned pens and pencils according to the invention is illustrated schematically in Figs. 7-11. Casting processes have been used for some time to produce costume jewelry and other ornamental items and offer advantages of both economical prototype and low volume production, and relatively low cost tooling, to provide precision parts having close tolerances and smooth surfaces, as well as providing intricate detail at a low cost-per-piece.

Surprisingly, and according to the principles of the invention, molten metal castings can be affixed onto wooden or plastic workpieces such as pen barrels, with little or no adverse effect on the barrel substrate. This results in spite of the fact that the melting or decomposition temperature of the wood or plastic substrate is well below the temperature of the molten metal being cast thereon. Such a process is not disclosed or suggested in the known prior art.

Heretofore, centrifugal casting has involved the use of a pair of complementary disk-shaped rubber mold halves having a plurality of molded cavities therein. When the complementary rubber mold halves are placed together, a multi-cavity mold is formed. The multi-cavity rubber mold is clamped together under pressure between metal plates in a motor driven table. As the mold spins on the table, molten metal is poured into the center sprue of the mold, and the metal is forced outwardly by centrifugal force through radial passageways to fill the mold. Rotational speeds typically can range from 100 to 1000 RPM, depending on the size of the mold and the material being cast. The rotation is then stopped, the mold is cooled, opened, and the cast parts therein removed.

In the process of the invention, a mold is first prepared by fashioning a mold-forming master, preferably out of brass, that will withstand the vulcanization process, which can be carried out at 400° F. and 600 p.s.i. The mold-forming master here, **24**, preferably brass, is shown in Fig. 7. The master **24** is in the shape of a pen shaft plus the desired shape of the final casting, all as shown in Fig. 7. The intricate details of this master **24** are limited only by the skill of the artisan who creates it, either by sculpting or molding.

In the mold-forming process, shown in Fig. 8, silicone rubber, typically in disks **26, 28** of 9-12 inch diameters, and 0.5 inch thickness, are molded by placing between them the brass masters **24**, talc is applied to act as a release agent, the discs are clamped together sandwiching the masters **24** therebetween, and the rubber premolds are vulcanized. The vulcanization process takes about 1.5 hours typically, after which the molds are cooled and opened and, as shown in Fig. 8, the masters **24** can be removed, indicated by the bold arrows, thus forming the complementary mold disks **26** and **28** and the multiple half cavities **36, 38**, now having the shape of the desired pen shaft and casting.

A mold having a pair of cavities is shown in Fig. 8. Additional cavities can be employed and consideration must be given to balance of the multiple cavity molds in the centrifugal casting process. Skill is required. Also shown for completeness in Fig. 8 are the inlet or sprue **30**, gates **42** and basin **40**, whose forming members are omitted for clarity herein.

Once the rubber mold having the desired mold cavities is prepared, casting of the product of the invention begins. The prepared mold disks **26, 28** are placed in the centrifugal spinning machine (not shown) and, as shown in Fig. 9, a prepared wooden or plastic tubular barrel **12** is placed in each mold half-cavity **36**. Each barrel **12** has been pre-treated as described hereinabove with its respective heat-resistant and/or hardening lacquer. The centrifugal spinning machine is started, after clamping the complementary molds **26, 28** together, and the desired hot molten metal is poured into sprue **30** and into the mold to fill all cavities **36, 38**. Once the cavities are filled, the spinning is stopped, the mold is cooled and removed from the machine, the half-molds **26, 28** are opened, and the product of the invention, duplicates shown here, are removed from the mold, as indicated by the bold arrows shown in Fig. 10.

In general, tolerances are critical in the casting operation because wood and plastic have different shrink factors than molten metal. Some trial and error may be required. Clamping pressures during casting are high, and the tubular barrels, especially where walls are thin, may require internal support to prevent collapse. A simple dowel may suffice.

In a preferred casting process, the clamping pressure is approximately 600 p.s.i., the casting alloy is a pewter tin alloy, designated OR-8x1b, HTC8001.29.0050, Contenti item 176-892, available from the Contenti Company, 123 Steward Street, Providence, RI, 02903. The temperature of metal at cast is between 650 to 900°F, and the spinning is at 300-500 RPM. The mold temperature is preferably about 150°F, but this is regulated to an extent by the cycle time and metal temperature at casting. Thin parts may require high heat, and the right balance for a given casting may also require some trial and error.

The barrels **12** having castings **14** thereon as shown in Fig. 10 may subsequently be plated with precious metals such as gold or silver. This plating may be accomplished by known techniques. Final assembly into a complete writing instrument **10** is depicted in Fig. 11.

Therein the coated barrel **12** having the casting **14** affixed thereto is shown receiving at its proximal end the clip **20**, ratchet **43** and advance mechanism **45**, activated by push button **22**, and being inserted into its distal end is the ink barrel **46** having writing tip **16**, extending through spring **44** and housing **18** which threadably engages the barrel (not shown) to anchor all components in place, thereby completing assembly of a writing instrument **10**, shown in Fig. 1, all according to the invention herein.

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While the invention has been disclosed herein in connection with certain embodiments and detailed descriptions, it will be clear to one skilled in the art that modifications or variations of such details can be made without deviating from the gist of this invention, and such modifications or variations are considered to be within the scope of the claims hereinbelow.